	Natural glucosides.	Emulsin.	Enzyme of yeast.
Simple derivatives of glucose.	Salicin	+	−
	Helicin	+	−
	Æsculin	+	−
	Arbutin	+	−
	Coniferin	+	−
	Phylbyrin	−	−
	Aprin	−	−
	Syringin	+	−
	Saponin	−	−
	Phloridzin	−	−
	Glucoside of mandelic nitrile	+	−
	Amygdalin	+	−
	Quercitrin	−	+

It would appear that the natural glucosides, which are for the most part phenol derivatives, probably belong to the group of β-glucosides. The indifference of some of these glucose derivatives to both enzymes is at present unexplained.

Configuration and Zymolysis of the Polysaccharoses.—The recent researches of E. Fischer on the hydrolysis of the polysaccharoses point to the fact that none of these carbohydrates is directly fermentable by the enzyme of yeast, but that without exception they first undergo hydrolysis by a hydrolytic enzyme associated with the ferment. The di-saccharoses—cane sugar, maltose, milk sugar, melibiose, trehalose, &c.—are anhydrides formed by the union of two hexoses. The structural formulæ of maltose and lactose are probably identical, seeing that each splits up on hydrolysis into two molecules of aldohexose, but since maltose yields only glucose, whereas lactose forms an equal number of molecules of glucose and galactose, the two compounds must be regarded as stereoisomeric. They probably correspond, too, with the α-methyl- and β-methyl-dextroglucoside, for emulsin hydrolyses lactose, but not maltose; whereas the enzyme of yeast produces the reverse effect.

Without discussing in detail the ingenious methods by which Prof. Fischer has successfully attacked the problem of the hydrolysis of the polysaccharoses, the following results may be briefly recorded.

The action of invertase, an enzyme which accompanies beer yeast, in hydrolysing cane sugar into glucose and fructose previous to fermentation, was first observed by O'Sullivan, and although Bourquelot and Lintner recorded a similar decomposition in the case of maltose, the experiments were not decisive. Fischer, however, extracted with water from dry yeast an enzyme which, unlike invertase, hydrolyses maltose, and which he has therefore named maltase of yeast. Instead of the aqueous extract, the dry yeast itself may be employed; in which case a little toluene must be added to the maltose solution to arrest the alcoholic fermentation.

The conclusion may be drawn that yeasts incapable of inducing alcoholic fermentation of cane sugar and maltose are destitute of invertase and maltase. This conclusion has been fully corroborated by subsequent experience.

Kephir grains and the yeast which ferments milk sugar do not ferment maltose, and are also without hydrolytic action upon it.

Saccharomyces martianus, which according to Hansen does not ferment maltose, does not hydrolyse it, and is therefore free from maltase. Beyerinck's *Schizosaccharomyces octosporus*, which acts on maltose but is indifferent to cane sugar, contains maltase but no invertase. *Monilia candida* is a particularly interesting case, since it contains neither invertase nor maltase, but nevertheless produces fermentation of both cane sugar and maltose. No aqueous extract which hydrolyses these two sugars could be obtained from it, but if the dried yeast is added to a solution of cane sugar in presence of toluene a vigorous hydrolysis is produced. The hydrolytic enzyme is present, but in this case it is insoluble in water.

Milk sugar, which is not attacked by beer yeast, is fermented by kephir grains and milk sugar yeast, which Beyerinck suspected to contain the hydrolytic enzyme lactase. The existence of this enzyme has been placed beyond question by Fischer, who has prepared the enzyme from kephir grains and milk sugar yeast in the dry state. It is accompanied by invertase, but maltase is entirely absent, and indeed no substance is yet known in which maltase and lactase are associated.

The hydrolysis of trehalose by an enzyme contained in *Aspergillus niger* and in green malt was observed by Bourquelot, and has since been confirmed by Fischer, who found also that a Frohberg dry yeast affected a similar but much more feeble decomposition.

Melibiose, which is a disaccharose, is obtained from raffinose. It is fermented by a low fermentation brewer's yeast. Fischer and Lindner have now been able to prove the existence in this yeast of a hydrolytic enzyme which they call melibiase.

In regard to the action of different yeasts on α-methylglucoside and its congeners, Fischer has shown that all yeasts which ferment maltose attack the α-methyl glucoside. The question then arises, has each glucoside or polysaccharose its special enzyme and each fermentable sugar its special ferment or zymase? Fischer considers such a proposition untenable, but inclines to the view that one and the same enzyme of yeast, maltase, attacks α-methyl glucoside as well as melibiose and the complex carbohydrates known as dextrins.

Theoretical considerations.—All these facts indicate that the chemical action of enzymes, in which may be included the zymase of yeast, is of quite a special character and distinct from that of the more simple organic and inorganic compounds. The cause of this selective action probably resides in the asymmetrical structure of the enzyme molecule. Although these substances are not yet known in the pure state, their relation to the proteids is so close and their derivation from the latter so probable, that they may be regarded as optically active molecular aggregates, and consequently asymmetrical. Fischer and Thierfelder have based upon this the hypothesis that between the enzymes and those substances which they attack, there must exist a correspondence in molecular configuration, which they compare to a lock and key. The observations of G. Bertrand on the relation of the polyvalent alcohols to their oxidisability by the sorbose bacteria, shows clearly that stereochemical considerations may be applied to other fermentive processes. Fischer applies the same idea to the chemical changes occurring in the bodies of higher organisms, which lead to the conclusion that in the chemical changes in which the proteid substances take a part as active masses, undoubtedly the case with protoplasm, the configuration of the molecule (*i.e.* space arrangement of the atoms) plays a part fully as important as its structure (*i.e.* plane, or relative arrangement of the atoms). It is easy to conceive on this hypothesis that the three isomeric tartaric acids should be assimilated at an unequal rate in the organism of the dog, and that of two sugars so closely allied as glucose and xylose, it is only the former which is oxidised or converted into glycogen, whereas xylose passes unaltered through the system.

The results of stereochemistry may also throw some light on chemical transformations occurring in the organism. The four sugars, *d*-glucose, *d*-mannose, *d*-fructose and *d*-galactose are not only those that are exclusively attacked by yeast, but those which in the animal system are assimilated as glycogen. The conversion of glucose, mannose and fructose into one another was first achieved by Fischer by a process of alternate reduction and oxidation, since when Lobry de Bruyn and van Ekenstein have arrived at the same result by simply warming with alkalis.

As von Baeyer pointed out twenty-eight years ago, all these phenomena may be explained by the intramolecular migration of an oxygen atom from one carbon atom to the other. The intermediate phases of this process are unknown; but alcoholic fermentation is an example of the facility with which the operation is effected. In regard to the assimilation of carbon dioxide by plants, which gives rise to exclusively active sugars, a similar explanation may be found, seeing that the carbon dioxide in process of assimilation is associated with the optically active chlorophyll bodies.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. F. C. Kempson, of Caius College, has been reappointed a Demonstrator of Anatomy for one year; and Dr. Elliot-Smith, Fellow of St. John's College, a Demonstrator of Anatomy for five years.

The work of Mr. W. Rosenhain, advanced student of St. John's College, which includes the joint Bakerian Lectures, with Prof. Ewing, delivered this year, has been approved for the University certificate of research.

Dr. Hill, Dr. Allbutt, Dr. Sladen, and Prof. Woodhead have

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been appointed representatives of the University for the organisation of a Congress on Tuberculosis to be held in London in 1901.

AT the annual prize distribution of the Merchant Venturers' Technical College, Bristol, on December 20, an address will be given by Sir W. H. White, K.C.B., F.R.S., Director of Naval Construction to the Admiralty.

WE learn from the *British Journal of Photography* (December 1) that Dr. Hans Harting, formerly of Messrs. Zeiss, of Jena, has joined the Board of Management of Messrs. Voigtlander and Sohn. He succeeds Dr. Miethe, who was recently appointed Professor of Chemistry and Spectrum Analysis at the Technical High School, Berlin.

THE annual prize distribution and conversazione of the Northampton Institute, Clerkenwell, will be held to-morrow evening, December 8. Sir Henry Roscoe will distribute the prizes. A comprehensive programme of exhibits and short lectures referring to the various sides of the Institute's work has been prepared. Dr. Walmsley will describe alternating currents; Mr. John Ashford, flying machines in fiction and fact; and Mr. A. W. Martin, high speed telegraphy. There will also be special demonstrations of liquefaction of air, alternate currents, ice-making, mortising by machinery, colour photography, rapid stereotyping, and other subjects.

THE *Pioneer Mail* announces that the Government of India have given their cordial approval to the Tata scheme for an India University of Research, recently formulated by a conference at Simla, and already referred to in these columns. As soon as all the details have been worked out, the necessary legislation for the incorporation of the new University will be undertaken. Meanwhile the Government of India commend the scheme to the liberality of the public, and wish it every success, while they acknowledge in the most cordial manner the public spirit shown in Mr. Tata's munificent endowment. The Government of Bombay will be asked to appoint an officer to arrange with Mr. Tata for the transfer of the property which is to constitute the endowment.

THE Calendars of University College, London, and the University College of Sheffield, for the session 1899-1900, have been received. In the former, the Dean of the Faculty of Science, Prof. T. Hudson Beare, refers to the part taken by the College in connection with the reorganisation of the University of London, and expresses pleasure that in the new University engineering is to be put on an equal with the sister professions, law and medicine, and that (if the draft statutes are adopted) it is to have its own Faculty and its own representatives on the Academic Council. A noteworthy addition to the Dean's report is a complete list, covering nine pages, of the original memoirs and writings which have emanated from the different scientific departments of the College during the past two years. In the Calendar of the University College of Sheffield it is announced that a bacteriological laboratory has been established, with a special demonstrator to devote the whole of his time to bacteriological investigations.

SOME interesting particulars with reference to the relative attention given to science in our secondary schools, as judged by the number of candidates who present themselves in scientific subjects in the public examinations usually taken by the pupils, is given in the December number of *The School World*. It appears that in January of this year, of 1250 candidates examined for matriculation in London University, 842 selected a language as their optional subject, and 408 a branch of science. The total number of candidates who were examined in the five optional science subjects was little more than half the number that selected French as the optional subject. At the last Oxford Senior Local Examinations, the number of papers worked in English subjects was 6977, in languages 2418, in science subjects 796; in addition to which 969 candidates took mathematics. In the Senior Cambridge Local Examinations in 1898, the number of papers in English subjects was 10,327, in languages 3391, in mathematics 1590, and in science 1838. Similar proportions are shown to exist among candidates who present themselves for other general examinations. The numbers show clearly that in most of our secondary schools science still occupies but a minor place in the curricula.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Microscopical Society, November 15.—Mr. E. M. Nelson, the President, in the chair.—Mr. C. L. Curties exhibited a new form of portable microscope by Leitz. It had a folding foot and a movable stage, to enable the instrument to be packed in a small compass. The body was not made to incline, but was furnished with coarse and fine adjustment, and the stage was fitted with a modified form of Abbé condenser, with iris diaphragm. The President thought the instrument would be useful to those requiring a very portable one; its great compactness was effected in an ingenious manner, while the working parts were well made and finished.—The President read a short note descriptive of a set of three simple hand microscopes on the Coddington principle sent for exhibition by Mr. Edward Swan. They were apparently made for a medical man, and could not be very old. Dr. Hebb said Prof. Groves had made some modification in the form of a hand microtome, and had sent it for exhibition. The President called attention to six photomicrographs of the larvæ of gnats, taken from life by Mr. J. T. Holder. The President exhibited an old Gillett condenser, dated July 20, 1849, which had a collar adjustment.—Dr. H. C. Sorby's paper on the preparation of marine worms as microscopical objects was read by the President in the unavoidable absence of the author. The subject was illustrated by beautifully mounted slides under microscopes.—The attention of the meeting was then directed to a fine exhibition of *Foraminifera* by Mr. A. Earland, shown under a large number of microscopes, with written descriptions explaining the points of interest in each slide.

Linnean Society, November 16.—Mr. G. R. Murray, F.R.S., in the chair.—Mr. J. E. Harting communicated particulars of several cases in which parrots had been poisoned by eating parsley. After commenting on instances in which plants that were innocuous to man had proved fatal to some of the lower animals, he mentioned in support of the converse case that the berries of the yew and privet, which are generally considered to be poisonous to man, were greedily eaten by blackbirds, thrushes, bullfinches, and other birds; while, on the other hand, several cases were on record of pheasants having been poisoned by eating yew leaves. The immunity of goats from yew poisoning was remarkable in view of the fact that deer and cattle died after eating the leaves of that tree, although it had been stated that the ill effects were due to the leaves having been eaten in a desiccated state, and not while growing on the tree.—Mr. W. C. Worsdell read a paper on the comparative anatomy of certain species of *Encephalartos*. The chief features of the anatomy were shown to be the presence of several vascular cylinders in the stem, a character found also in *Cycas* and *Macrozamia*; and the *medullary* system of vascular bundles, forming, as in *Macrozamia Fraseri*, Miq., a complex network, intimately united with a corresponding network of mucilage-canals. The system of mucilage-canals in the pith is continuous with that of the cortex, but the medullary bundles form an independent *primary* system. The mucilage-canal-system is probably of use as a storehouse of moisture during the dry season, when the roots and foliage die away.—Mr. W. T. Calman read a paper on a collection of *Brachyura* from Torres Straits. These Crustacea had been collected by Prof. Haddon on his first expedition to Torres Straits in 1888. It comprised about seventy-five species, three of which were described as new, namely, *Cryptocnemus Haddoni*, *Pilumnus cristipes*, and *Lambrus confragosus*. Among the species already known, concerning which some fresh details were given, was the minute parasitic *Hapalocarcinus marsupialis*. Although described forty years ago by Stimpson, it had escaped re-examination until now, notwithstanding that the curious gall-like growths to which it gives rise on corals are well known. The occurrence in this collection of the three known Indo-Pacific species of *Palicus* (*Cymopolia*), two of which have been recorded hitherto only from widely distant localities, afforded the author of this paper an opportunity for a detailed examination of their distinctive characters.

Geological Society, November 22.—W. Whitaker, F.R.S., President, in the chair.—On some remarkable calcisponges from the Eocene Tertiary Strata of Victoria (Australia), by Dr. George Jennings Hinde, F.R.S. The greater number of the sponges described were discovered by Mr. T. S. Hall, of Melbourne

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